Section 668—Miscellaneous Drainage Structures

668.1 General Description

This work includes constructing catch basins, drop inlets, manholes, junction boxes, spring boxes, drain inlets, special inlets with safety grates, and vertical tee sections.

Construct according to these Specifications and the lines and grades shown on the Plans, or as established by the Engineer.

668.1.01 Definitions

General Provisions 101 through 150.

668.1.02 Related References

A. Standard Specifications

Section 207—Excavation and Backfill for Minor Structures

Section 500—Concrete Structures

Section 607—Rubble Masonry

Section 608—Brick Masonry

Section 801—Fine Aggregate

Section 830—Portland Cement

Section 834—Masonry Materials

Section 843—Concrete Pipe

Section 853—Reinforcement and Tensioning Steel

Section 854—Castings and Forgings

Section 866—Precast Concrete Catch Basin, Drop Inlet, and Manhole Units

B. Referenced Documents

General Provisions 101 through 150.

668.1.03 Submittals

General Provisions 101 through 150.

668.2 Materials

The structures in this section may be constructed of brick, cast-in-place concrete, or pre-cast concrete, unless the Plans or Proposal specifies a specific type of construction.

Use rubble masonry only when specified on the Plans. Ensure that materials meet the following specifications:

Material	Section
Class “A” or “B” Concrete	500
Sand for Bedding Material	801.2.01
Fine Aggregate for Mortar	801.2.02
Portland Cement	830.2.01
Brick	834
Masonry Stone	834
Mortar and Grout	834
Nonreinforced Concrete Pipe	843
Steel Bars for Reinforcement	853.2.01

Material	Section
Gray Iron Castings	854.2.01
Precast Reinforced Concrete Catch Basin, Drop Inlet, and Manhole Units	866

Ensure that the materials for fabricating special inlets and their safety grates are according to Plan details.

Construct the following manholes and drainage structures from pre-cast or cast-in-place concrete:

- Structures within the backfill limits of mechanically stabilized embankment retaining walls
- Structures within 5 ft (1.5 m) of the wall foundation's front.

668.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

668.3 Construction Requirements

668.3.01 Personnel

General Provisions 101 through 150.

668.3.02 Equipment

General Provisions 101 through 150.

668.3.03 Preparation

General Provisions 101 through 150.

668.3.04 Fabrication

General Provisions 101 through 150.

668.3.05 Construction

A. Excavation and Backfill

Excavate and prepare foundations for the structures included in this section; place pipe through the structures according to Section 207.

B. Concrete

Concrete units may be either poured-in-place or precast. Construct units as follows:

1. Poured-in-Place Units

   The throat or other nonreinforced portions of catch basins may be Class B concrete. Use Class A concrete for the top slab. Construct units according to Section 500.

2. Pre-Cast Reinforced Concrete Units

   Construct pre-cast reinforced concrete units as follows:

   a. Holes for Pipe

      Cast each unit with the number and dimensions of pipe holes necessary to incorporate the unit into the drainage system according to Plan details.

      Installation conditions may require additional pipe for which no holes have been cast. If so, make the holes and repair or replace, to the Engineer's satisfaction, pipe damaged during the process.

   b. Pipe Connections

      Use mortar or Class A concrete to connect pipe to units.

   c. Installation of Pre-cast Concrete

      1) Pre-cast Reinforced Units: Set these units to within 1/2 in (± 13 mm) of grade on a bed of compacted sand 2 in to 3 in (50 mm to 75 mm) thick.

      2) Sectional Precast Reinforced Units: When using these units to build-up extra-depth catch basins or drop inlets, fill the joints between sections with mortar and wipe smooth.

C. Brick Masonry

Construct brick masonry structures according to Section 608.

D. Mortar Rubble Masonry

Construct rubble masonry structures according to Section 607.

E. Castings

Hold frame castings securely in place to proper line and grade. Make castings an integral part of the complete structure. After completion, ensure that castings subject to traffic use are firm and stable under traffic.

F. Maintenance

Thoroughly clean fallen masonry, silt, debris, and other foreign matter from structures.

G. Safety Grates

Fabricate safety grates according to Plan details.

H. Sanitary Sewer Manholes

Ensure that sanitary and combination sanitary and storm sewer manholes conform to the following requirements and the related Specifications.

1. Form Invert Channels

   Shape invert channels to the lines and grades shown on the Plans, or as established by the Engineer. Ensure that channel surfaces are smooth.

   Form invert channels by one of the following methods:

   - Directly form the invert channel in the concrete base of the manhole.
   - Construct the invert channel of brick and mortar.
   - Lay half-round tile in the concrete base of the manhole.
   - Lay round sewer pipe through the manhole and cut out the top half of the pipe after the concrete base has set. Do not use this method if the Plans provide for an offset drop in the invert.

2. Plaster Outside Walls

   Plaster outside walls as follows:

   a. Saturate the outside wall of each brick manhole with water.

   b. Plaster the wall smooth with a mortar coat at least 1/2 in (13 mm) thick. Manufacture the mortar according to Section 834 with the following exceptions:

      - Manufacture the mortar with one part cement to two parts mortar sand.
      - Do not add hydrated lime.

3. Connections to Manholes

   Complete manhole connections to the Engineer's satisfaction and as follows:

   a. Carefully connect existing sewer lines to new manholes to prevent infiltration of foreign substances.

   b. Construct manholes in or adjacent to existing sewer lines according to Section 660 to maintain continuous sewage flow in existing lines.

668.3.06 Quality Acceptance

General Provisions 101 through 150.

668.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

668.4 Measurement

Catch basins, drop inlets, manholes, junction boxes, drain inlets, special inlets, and safety grates, complete in place and accepted, are measured for payment according to the following:

A. Catch Basins and Drop Inlets

Each catch basin or drop inlet is grouped for measurement as follows:

- Group 1: Structures connected to pipe 36 in (900 mm) or less in diameter, regardless of the pipe skew
- Group 2: Structures connected to pipe over 36 in (900 mm) diameter regardless of the pipe skew

Catch basins or drop inlets, complete in place and accepted, are measured by the unit.

In addition, each catch basin or drop inlet deeper than 6 ft (2m) is measured for additional payment. The extra depth is measured in linear feet (meters).

B. Manholes

Manholes are measured for payment as follows:

1. Sanitary and Storm Sewer Manholes

   Sanitary sewer manholes and storm sewer manholes are measured separately and divided into two types:

   - Type 1: Structures connected to pipe 42 in (1050 mm) or less in diameter regardless of the pipe skew
   - Type 2: Structures connected to pipe 48 in to 84 in (1200 mm to 2100 mm) diameter regardless of the pipe skew

   Each manhole is measured by the unit.

2. Manhole Additional Depth

   In addition to Types 1 and 2 above, each Manhole deeper than 6 ft (2 m) is measured for additional payment, termed "manhole additional depth." This additional depth is measured in linear feet (meters) and does not include the upper 6 ft (2 m). Manhole additional depth is classed as follows:

   - Manhole Additional Depth, Class 1: Applies to each manhole deeper than 6 ft (2 m), but not deeper than 10 ft. (3 m) Class 1 payment is for the manhole depth between 6 ft and 10 ft. (2 m and 3 m).
   - Manhole Additional Depth, Class 2: Applies to each manhole deeper than 10 ft (3 m), but not deeper than 20 ft (6 m). Class 2 payment is for the manhole depth between 6 ft and 20 ft (2 m and 6 m).
   - Manhole Additional Depth, Class 3: Applies to each manhole deeper than 20 ft (6 m), but not deeper than 30 ft (9 m). Class 3 payment is for the manhole depth between 6 ft and 30 ft (2 m and 9 m).
   - Manhole Additional Depth, Class 4: Applies to each manhole deeper than 30 ft (9 m), but not deeper than 45 ft (14 m). Class 4 payment is the manhole depth between 6 ft and 45 ft (2 m and 14 m).

   Manhole additional depth is measured for payment at the class that includes the greatest depth below the original 6 ft (2 m).

   For example, a manhole 32 ft (11m) deep would be measured and paid for as follows:

Storm (or sanitary) sewer manhole, type_____	Per each
Storm (or sanitary) sewer manhole, type_____, additional Depth Class 4	26 linear feet (9 linear meters)

C. Junction Boxes, Spring Boxes, and Drain Inlets

Junction boxes, spring boxes, and drain inlets are measured by the unit.

1. Each junction box will be complete according to Plan details.
2. Each drain inlet will consist of a pipe elbow or tee, concrete collar, and casting of the required diameter.
3. Each spring box will be complete according to Plan details.

D. Safety Grates

Safety grates fabricated and installed according to Plan details are measured by the square foot (meter), computed from the overall surface dimensions of each grate.

E. Special Inlets for Safety Grates

Special inlets, complete in place, are measured for payment in cubic yards (meters) according to Section 500.

F. Vertical Tee Sections (or Saddles)

Vertical tee sections are not measured for separate payment.

668.4.01 Limits

General Provisions 101 through 150.

668.5 Payment

Payment for the various structures under this Section will be made as follows:

A. Catch Basins and Drop Inlets

Catch basins or drop inlets will be paid for at the Contract Price per each.

Depth in excess of 6 ft (2 m) will be paid for at the Contract Price per linear foot (meter).

Payment is full compensation for the following:

- Furnishing castings
- Making pipe connections regardless of skew
- Providing materials, making forms, and disposing of surplus material

B. Manholes

Sanitary sewer and storm sewer manholes, complete in place, will be paid for at the Contract Price per each.

Manhole additional depth of the appropriate class will be paid for at the Contract Price per linear foot (meter).

Payment is full compensation for the following:

- Furnishing castings, fittings, and other appurtenances called for on the Plans to complete the Item
- Making pipe connections regardless of skew
- Providing materials, making forms, and disposing of surplus material

NOTE: No additional payment will be made for connecting manholes to existing or new sewer lines. Include costs related to connections in the Contract Price for the structure.

C. Junction Boxes, Spring Boxes, and Drain Inlets

Junction boxes, spring boxes, or drain inlets will be paid for at the Contract Price per each. Payment is full compensation for the following:

- Furnishing castings, fittings, and other appurtenances called for on the Plans to complete the Item
- Making pipe connections regardless of skew
- Providing materials, making forms, and disposing of surplus material

D. Pipe

Pipe entering or exiting catch basins, drop inlets, manholes, junction boxes, spring boxes, or drain inlets, will be paid for under the section of the Specifications governing the pipe.

E. Sand Bedding Material for Precast Structures

No separate payment will be made for this material. Its cost is included in the Contract Price for the structure under which it is used.

F. Excavation and Normal Backfill

No separate payment will be made for excavation and normal backfill. Their cost is included in the Contract Price for the structure being excavated.

G. Safety Grates

Safety grates will be paid for at the Contract Price per square foot (meter).

H. Inlets for Safety Grates

Inlets for safety grates will be paid for at the Contract Price per cubic yard (meter) of Class “A” concrete, including reinforcing steel.

I. Vertical Tee Sections (or Saddles)

Vertical tee sections will be included in payment for the section of structure they are incorporated in.

No separate payment will be made for excavation, backfill, and disposal of surplus material.

Payment will be made under:

Item No. 668	Catch basin, group_____	Per each
Item No. 668	Catch basin, group_____ additional depth	Per linear foot (meter)
Item No. 668	Drop inlet, group_____	Per each
Item No. 668	Drop inlet, group_____ additional depth	Per linear foot (meter)
Item No. 668	Sanitary sewer manhole, type_____	Per each
Item No. 668	Sanitary sewer manhole, type_____, additional depth class_____	Per linear foot (meter)
Item No. 668	Storm sewer manhole, type_____	Per each
Item No. 668	Storm sewer manhole, type_____, additional depth class_____	Per linear foot (meter)
Item No. 668	Junction box	Per each
Item No. 668	Spring box	Per each
Item No. 668	Drain inlet, __ in (mm)	Per each
Item No. 668	Safety grate, type_____	Per square foot (meter)
Item No. 500	Class A concrete, including bar reinforcing steel	Per cubic yard (meter)

668.5.01 Adjustments

General Provisions 101 through 150.